NASA Glenn Success Stories

Flexible Thin Film Heat Flux Sensor (FTFHFS)

The Goodyear Tire & Rubber Company

TECHNOLOGY

Based on the Wheatsone Bridge Circuit, this heat flux sensor is easier to fabricate than a sensor based on thermocouples and produces a signal voltage an order of magnitude greater than the thermocouple-based sensor.

COMMERCIAL APPLICATION

Ideal in engine and furnace components for process control, modeling validation, determination of cooling requirements, and general calorimetry in rocketry, aerospace, and automotive environments. This thin flexible sensor can also measure the heat flux in a rolling tire, a complex time varying system with curved, narrow features. Currently, it is being used on a wide variety of tires.

SOCIAL / ECONOMIC BENEFIT

- Durable tires produce less scrap and help alleviate the pressure exerted on land fills, thus helping the environment.
- The thin film (sensor thickness is approximately 0.01mm) types have the advantage of high frequency response and minimal flow disturbance.
- Similar models can measure heat flux at high temperatures – up to 1000°C

Heat flux sensor typical application on a passenger tire

NASA APPLICATIONS

This sensor will enable thermal control in advanced multi-use extravehicular (EVA) pressure suits for future lunar missions. The heat flux sensor is small enough to allow measurement of heat flux of the thermal cooling system as well as the heat flux from various parts of the suit. The correlation of these parameters will give a more accurate estimate of the astronaut's metabolism and any external thermal loading and permit a more rapid adjustment of the suit's cooling system.

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